1: Hollis G-5 (ca. 1894-1904) 1905
FL12 Masai FL12

174 A tribe coming from the north like the Masai, and possibly at one time in touch with races influenced by ancient Egypt, may conceivably represent not an improvement of the primaeval African stock but a degeneration of some other race. Still, the accounts which we have of the Bari and Dinka ascribe to them the same vague belief in a supernatural power, which most inquirers have reported as existing among the Masai, and an absence of traditions respecting the origin of the human race[1].

175 648 The history of the Masai, as far as we know it for the last hundred years, presents as its most important feature a conflict between the pastoral and agricultural sections, ending in the victory of the former and the annihilation of large settlements of the latter. The conflict was disastrous for the race, for the portion which survived depended entirely on cattle and raiding for subsistence. The herds suffered severely from plague in the eighties, and the advent of Europeans and the gradual introduction of the Pax Britannica could not be otherwise than unfavourable to the pre-eminence of a tribe whose prosperity depended so largely on continually plundering their neighbours. Nevertheless from at least 1850 to the early eighties the pastoral Masai were a formidable power in East Africa. They successfully asserted themselves against the Arab slave-traders, took tribute from all who passed through their country, and treated other races, whether African or not, with the greatest arrogance. About 1859 they raided Vanga, on the coast near the present German frontier. Thomson (*Through Masai Land*, 1885) describes how, in 1883, they entered his camp and ordered about the whole caravan, including himself, as if they had been masters and the travellers slaves. This period of triumph was succeeded by one of disaster. Rinderpest attacked the cattle and small-pox [731] [64] human beings. The surrounding tribes who had suffered from their raids were not slow to revenge themselves for the oppression and plunder of the past, and a severe famine completed the catalogue of misfortunes. The numbers of the 161 175 Masai were undoubtedly greatly reduced, and at present those found in British East Africa only amount to a very modest figure, variously estimated at from 25,000 to 12,500. The latter estimate, which is the latest and perhaps the most correct, is based on the assumption that there are 7,500 in the

[1] See Mitterrutzner, *Die Dinka Sprache*, 1866, p. 56, &c. It is true that some expressions ascribed to the Dinka, such as 'We do not know—the wise men know,' might be interpreted as a consciousness of the loss of traditions.

1: Hollis G-5 (ca. 1894-1904) 1905
FL12 Masai FL12

claim to belong to them live elsewhere. Merker gives as the principal divisions three provinces, Kisongo, Loita, and Olbruggo. This is perhaps not according to Masai traditions, but is not incorrect as a practical description of the present distribution of the tribe. The Loita and Olbruggo, also known as Elburgon and Purko, are both subdivisions of the Naivasha district, of whom the former acquired importance by refusing to accept the present Laibon, Lenana, and following instead his brother Sendeyo. Besides these districts, there are four clans representing genealogical not territorial divisions: Aiser, Meñgana, Mokesen, and Molelyan. The Aiser seem to enjoy a certain primacy. The medicine men all belong to this clan, which is specially connected with Mount Ngong (to the south of Kikuyu), also called Ol-doinyo loo-'l-Aiser, the mountain of the Aiser.

According to the social system of the pastoral Masai the male sex is divided into boys, warriors, and elders. The first stage continues until circumcision, which may be performed any time between thirteen and seventeen, or sometimes in the case of poor people not till twenty. Those who are circumcised about the same time (see p. 261 for details) are said to belong to the same age, and are known collectively by a distinctive name, such as 'the White Swords' or 'the Invincibles.' After circumcision the warriors plait their hair, but, except for a small skin hanging over the shoulders, and their arms and ornaments (which are described by Mr. Hollis), go absolutely naked. They subsist entirely on meat, milk, and blood, and in particular may not smoke or touch intoxicants. They do not live with the married people, but in separate kraals with the immature unmarried girls, with whom they are allowed to cohabit freely. Tradition[1] (see p. 117) ascribes this practice to the fear that if girls were kept away from the society of their own warriors, they would let themselves be seduced by the enemy; but the remedy has been worse than the danger it was to avert. The direct physical evil is considerable, and is partly responsible for the diminishing numbers of the race. Besides this, female morality after such a girlhood was naturally low, even when the Masai kept to themselves. Now that they have come into contact with civilization, prostitution and venereal disease have become deplorably frequent. About the age of twenty-seven or thirty, or nowadays when raiding is forbidden somewhat earlier, a warrior marries and settles down. If he

[1] It is said that among the Dinka, Bari, and Shilluk there are similar customs of free love.

7: Hailey G-4 (No date) 1950 FL12 Masai FL12

divided into two sections, the agricultural ('l-oikop) and the pastoral Masai, there now remains in Tanganyika little vestige of the former.[1] A few scattered plots are cultivated by Masai, but it is with the help of alien labour. For the rest, there a little cultivation by the small Sonjo Tribe (3,521 in the 1948 Census), a people living below the Rift Wall who have not been assimilated by the Masai. The only other tribe in the District, the Dorobo (believed to number about 1,500), who are known traditionally as the "hunting people," are possibly a survival of the original inhabitants, and have become practically a servile class to the Masai.

As a pastoral people the Masai are semi-nomadic in the sense that they move with their herds in order to avail themselves of the seasonal variations in water supplies, so that they in effect practise a system of rotational grazing. They are credited with the possession of three-quarters of a million cattle and large herds of sheep and goats, but the number of their stock is subject to large and rapid variation in times of drought, and moreover East Coast fever, rinderpest and other diseases take a heavy toll of them. In the late 'eighties a combination of drought and disease almost wiped out their cattle and greatly reduced the numbers of the people themselves. Though like many other African pastoral tribes they make a cult of their cattle, they show little interest in improving their quality, and in the past have been prepared to dispose of them only in so far as they might need cash for their Poll Tax or for the few articles of food required to satisfy a people whose ordinary diet is limited to milk, meat and blood. To some extent, this position was improved during the recent War, which provided a stimulus to production of beasts for sale.

From an economic point of view therefore the Masai present a difficult problem, since the contribution they make to the economy of the Territory does little to justify their occupation of so extensive an area as twelve million acres. From a social point of view they are also a problem, owing to their reluctance to avail themselves of facilities for education. And as will be further explained in the following pages, they present an equally difficult problem of native administration, for their social system is still reminiscent of a period when their chief concern was in fighting or raiding at the expense of their neighbours.

THE FORMATION OF THE SYSTEM OF NATIVE AUTHORITIES

As already indicated, the diverse social and economic conditions prevailing in different parts of the Province have been reflected in the variety of forms taken by the Native Authorities as now constituted. Before, however, proceeding to describe these in detail, it will be convenient to give here a statement which summarizes their chief features. See page 284.

THE MOSHI NATIVE AUTHORITIES

In the Moshi District the present formation of the Chagga Native Authorities is the result of a somewhat radical reorganization carried out in 1946. Up to that time the Chagga had been split up over nineteen chiefdoms, divided from each other not only physically by the deep ravines of the mountain side, but also politically by the obstinate clan feuds and jealousies of past days. These chiefdoms were all treated as of equal standing, though their jurisdiction varied from 11,500 taxpayers in the Machame chiefdom to 400 in the Mrao. They were united in a Council of Chagga Chiefs, which was conspicuous mainly

[1] The Masai, A. C. Hollis, 1905, page xi and xiv.

[pp. 284-286 not processed]

13:Huntingford E-4 (no date) 1953 FL12 Masai FL12
Agricultural Masai

In 1932 the Il-Tiamus numbered about 2,250 (3,423 according to the 1948 Census), and though they are of Masai stock, being descended from a Sambur section called Il-Doigio, they have admitted a variety of refugees including Kamasya, and become rather mixed. According to von Höhnel they had originally four villages at the south end of Lake Baringo, but two were deserted on account of Masai and Suk raids, and some of the inhabitants, having lost all their cattle, took refuge on Kokua Island in Lake Baringo. They are expert swimmers and possess canoes, though von Höhnel saw none in 1887. Their dwellings are round huts with rather high-pitched and somewhat convex thatched roofs, and walls of posts and sticks. These are crowded into two permanent villages known as " Njemps Kubwa " and " Njemps Ndogo " in the Tigrish valley a few miles south of Lake Baringo; the closely packed huts almost touch each other, and the mud-walled granaries are surrounded by strong palisades.

In general the Il-Tiamus keep as close as they can to the dress and customs of the pastoral Masai; they have circumcision and *eunoto* and other ceremonies, and practise the " free-love " system of the pastoralists, though without the *manyatas*. Today they have some 180,000 acres of poor land, most of it unfit for cultivation; but they have acquired, since the establishment of British rule, some 12,000 or more head of cattle, and 30,000 goats and sheep, thus achieving in part the ambition of all Il-Oikop to become cattle people again. In the time of Thomson and Teleki, however, Njemps was an important station on the caravan route, and von Höhnel noted that they had a large extent of cultivated land. This was divided into blocks (he says of three to four miles square) which were intersected by irrigation channels bringing water from dams across the river Tigrish. This system was still working in Dundas's time, who says that the opening of the main ditch was performed with the sacrifice of a sheep at the mouth of the ditch.[12] Besides agriculture, the Il-Tiamus fished and hunted, using the bow, and spears of Suk and Turkana types.

It is possible that the fishing group called Il-Molo who live on the east shore of Lake Rudolf is to be classed as Il-Oikop.[13] They subsist on a diet of fish alone which, when Teleki and von Höhnel saw them in 1888, had produced no ill-effects; but it seems now to have resulted in considerable physical degeneration, and in the appearance of rickets in all members of the group. There seems to be a good deal of Gelaba blood in them.

The Il-Arusa round Mount Meru are a large tribe of agricultural Masai, originally of Bantu stock, but now accepted by the pastoral Masai as worthy of recognition as a group which can pay and receive cattle for compensation in cases of homicide. The Baraguyu in Southern Masailand are also to be classed as agricultural Masai.[14]

SOCIAL ORGANIZATION AND POLITICAL STRUCTURE

Social Organization

Life Cycle

From birth to circumcision a male is a boy, *ol-ayioni*. At circumcision[15] he enters an age-set and becomes a warrior, *ol-murrani*, " one who is circumcised," and may associate with unmarried girls. At the *ol-gesher* ceremony he becomes an elder, *ol-moruo*. Warriors may marry when they become senior warriors. After the *ol-gesher* the newly made elders attend to their family concerns, and get wives

[12] K. R. Dundas, *JRAI*, XL, pp. 49–55.
[13] W. S. Dyson and V. E. Fuchs, " The Elmolo," *JRAI*, 1937, LXVII, p. 327; von Höhnel, II, pp. 138–40.
[14] The people known as WaMeru in northern Tanganyika are not Masai, but people of Bantu stock who have imitated them.
[15] There is some uncertainty as to the age at which boys are circumcised. Hollis gives the limits as 13–17 years; Fosbrooke gives the lower limit as 16 or 17.

14:Orr & Gilks D-4 (no date) 1931 FL12 Masai FL12
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child population since those with active yaws are discouraged from attending school. It is known, however, that bone deformities are produced only in the tertiary stage of the disease. Callanan (1926) noted in about 2,000 cases of yaws in children that 32·1 per cent. of male children and 21·6 per cent. of female children had the disease in the tertiary stage. Hence, even assuming that all children have yaws, and that every case of tertiary yaws involves bony deformity, it is obvious that in at least half of the 62·6 per cent. of male children, and 43·7 per cent. of female children with bone deformities, the occurrence of these deformities cannot be explained as due to yaws.

In addition to bone deformities, 40 per cent. of the boys had some obvious dental defect, 48 per cent. were clinically anæmic, and 62 per cent. suffered from spongy gums. There was also a high incidence of enlarged tonsils and cervical adenitis. The general condition was poor.

Kikuyu girls showed a lower incidence of all defects than the boys and were much superior in general condition.

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The Masai village children present a very different picture, bone and dental defects and anæmia being relatively uncommon.

M [146]

The results of the physical examinations are presented graphically in Graphs 7 to 10. It should be noted that, while there appears to be a correlation between diet and the incidence of bone and dental defects and anæmia, there is none between diet and the incidence of enlarged tonsils and cervical adenitis.

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Table showing percentage Incidence of different Defects in Kikuyu and Masai Children.

	Kikuyu.		Masai.	
	Boys.	Girls.	Boys.	Girls.
Bone deformities	62·6	43·7	11·7	14·6
Dental caries	13·7	13·1	1·6	3·6
All dental defects	40·0	28·8	8·3	7·3
Anæmia	47·8	38·9	11·7	8·5
Enlarged tonsils	56·0	53·3	35·0	52·4
Cervical adenitis	52·0	47·6	40·0	59·8

K M [143]

In the course of the investigation, records of cases attending native hospitals in the Kikuyu and Masai reserves were examined as to the incidence of various conditions. The data for the Kikuyu include figures from the hospitals at Keruguya, Fort Hall, Nyeri and Githumu. Unfortunately, there is only one hospital in the Masai reserve, that at Narok, the seat of the district commissioner and a trading centre. The patients are therefore not all Masai, about 20 per cent. being Indians or natives of other tribes. We have no information as to the distribution of cases between these and Masai. The following table shows the results expressed as percentages of the number of cases analysed :—

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Kikuyu FL10

Average Incidence of various Diseases as percentage of Total Cases.

District.	Total No. of cases.	Yaws.	Malaria.	Bronchitis.	Pneumonia.	Influenza.	Phthisis.	Arthritis.	Rheumatism.	Gonorrhœa.	Helminthiasis.	Ulcers.	Constipation.
Kikuyu : Out-patients ..	45,003	13·8	11·6	14·6	0·3	1·9	0·2	—	2·5	0·5	7·1	8·1	4·7
Kikuyu : In-patients ..	4,204	21·6	24·6	11·1	7·3	1·0	3·7	—	5·0	1·2	10·3	10·9	—
Masai : Out-patients ..	1,161	0·2	1·0	12·1	—	2·9	0·2	4·2	0·3	0·8	0·1	—	26·0
Masai : In-patients ..	132	5·3	1·5	2·3	3·8	3·0	0·8	1·5	—	—	0·8	—	0·8

K M 164

K M 164 It appears at once that the incidence of yaws, malaria, helminthiasis and ulcers is higher amongst the Kikuyu, while, on the other hand, the occurrence of chronic constipation and arthritis is more frequent amongst the Masai. Pulmonary disease appears to be somewhat more frequent amongst the Kikuyu, especially in the in-patients.

It is obvious, however, that hospital statistics cannot truly represent the general incidence of disease in a native tribe. For this reason an attempt was made by the field worker to estimate the proportions of the diseases encountered most frequently in the course of his survey. Altogether, about 12,000 natives of both tribes were seen. Of those who attended for medical treatment, a large number in both tribes required dental extractions, and many were cases of local injury and conjunctivitis. Conjunctivitis is very common amongst the Kikuyu, especially the women, and less common amongst the Masai. The following table indicates approximately the incidence of the most common diseases in the two tribes (as percentages of the total number of cases of these diseases encountered in each tribe) :—

	Kikuyu.	Masai.
Bronchitis	28	4
Pneumonia	3	—
Tuberculosis	6	1
Ulcers	33	3
Malaria	18	2
Gonorrhœa	1	8
Intestinal stasis	4	45
Arthritis	2	35
Helminthiasis	5	2

With the exception of pulmonary conditions, this estimate is in good agreement with the hospital data. As regards pulmonary disease, the field worker's estimate is 37 per cent. for the Kikuyu and 5 per cent. for the Masai, while the hospital statistics (calculated on the same basis) show 34 per cent. in Kikuyu and 27 per cent. in Masai. Different possible explanations might be offered for the high figure from the Masai hospital. We have already noted that 20 per cent. of the patients at this hospital are not Masai. The figure for pulmonary disease might possibly be altered to some extent by exclusion of natives other than Masai. Again, we have no information as to possible dietary and environmental differences between Masai living in the neighbourhood of Narok as compared with the more remote parts of the Reserve. In this connection it is of interest to note that Masai prisoners in Nairobi Gaol appear to be particularly susceptible to pulmonary infections (Ann. Med. Rep. Kenya, 1923). It might be thought that their susceptibility is increased by the drastic change in diet and environment to which they are subjected in gaol. It is obvious, in any case, from this observation, that the Masai have

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no marked tribal immunity to pulmonary conditions, and that any superior resistance they may show under natural conditions is probably correlated with either superior diet or environment.

It was the general impression of the field worker that disease was less common amongst the women in the Kikuyu reserve than amongst the men. This impression is supported, as far as helminthic infection is concerned, by observations by Vint (1929). In a series of post mortem examinations of 104 cases of men and women, only 19, or 18 per cent., were found free from helminthic infection. Of the 104 cases, 11 were women and 4 of them, or 36 per cent., were free from helminths. Similar evidence is found in clinical records of examinations of fæces at Nairobi Medical Laboratory in which 74 per cent. of men were found to be infected and only 49 per cent. of the women.

Tuberculosis also, as judged by hospital statistics, appears to be less common in women than in men. Wilson (1928) says "There is one noteworthy feature of all our tuberculosis statistics, and that is the overwhelming proportion of male patients," and he also states that pulmonary tuberculosis is rare in native children.

There is, of course, always the difficulty about hospital data that it may be argued that women do not go to hospital as much as the men, but even if this is true, since pulmonary conditions constitute a large proportion of all hospital cases, it seems unlikely that the proportion of women with tuberculosis going to hospital would be lower than that of men.

These indications, taken along with the marked superiority of girls over boys as described from the clinical examination of children, and the admittedly superior general condition of women as compared with men, point to an effect on general condition and health of the difference in diet of the sexes. There can be little doubt that the dietary of the young children, the girls and the women, is better balanced than that of the older boys and men, and this appears to be clearly reflected in differences in physique and health.

III.—LABORATORY AND HOSPITAL WORK.

The laboratory work was carried out by the late Dr. J. M. Henderson in conjunction with Dr. Kelly, Dr. Harvey and other members of the staff of the Medical Research Laboratory in Nairobi, which is under the direction of Dr. W. H. Kauntze. It included analyses of hospital and prison diets and metabolism experiments on native prisoners to determine the effect on weight, composition of the blood, and retention of calcium and phosphorus, of certain additions to these diets.

14:Orr & Gilks D-4 (no date) 1931 FL12 Masai FL12
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calcium deficient diet, the first effects of increasing the intake of calcium would be in the consolidation of the existing bone rather than in increased rate of growth in length. The suggestion of a favourable effect on the younger boys, however, points to the desirability of further tests. It would also be of interest to determine in tests carried over much longer periods whether increases such as those procured in this experiment represent merely temporary stimulation of growth, or whether they would be maintained and represent true increases in height.

After supplement feeding was stopped, the measurements of height and weight were continued from March to September. The results are tabulated below.

Diet.	Average heights—inches.			Average weights—lb.		
	March.	September.	Increase.	March.	September.	Increase.
Basal	62·533	63·192	0·659	107·067	108·442	1·375
Maize	62·955	63·741	0·786	107·366	108·071	0·705
Maize and bone flour ..	62·863	63·540	0·677	107·669	109·065	1·396
Milk	62·986	63·743	0·757	112·871	111·643	—1·228

It will be seen that the rates of increase in both height and weight are less in all groups than in the period August to March. As regards height, the beneficial effects of the supplements appear to be carried over into the post period, but only the maize and bone flour group continued to put on weight at a greater rate than the controls.

The superiority of the results with milk during the feeding tests is in agreement with the results of milk feeding experiments on school children in Scotland (Orr, 1928, Leighton and Clark, 1929). In these tests, made on 1,157 children, quantities of milk varying from ½ of a pint to 1 pint of milk, according to age, were fed from November, 1927, to June, 1928. Half of the children received milk and the other half a supplement of biscuits equal in caloric value to the milk. The average increases in height in the milk group were 23·5 per cent. greater than in the controls, and the average increases in weight 45·37 per cent. greater.

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(c) The Etiology of the Tropical Ulcer.

Since tropical ulcer is so common amongst the Kikuyu and comparatively rare amongst the Masai, and since the dietary habits of these two tribes are very different, it was thought that some deficiency in the diet might be a predisposing cause. A study of the etiology, with special reference to the nutritional state of the patients, was therefore made. Clinical data, with notes on the effect of different forms of dietary treatment, were collected in 140 cases, and blood

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examinations were made to ascertain whether any differences could be detected between ulcer and non-ulcer cases.

(i) *Description of Ulcers.*

The ulcers occur chiefly on the lower outer part of the legs, most commonly of all on the lower outer aspect of the left leg. On admission to hospital they vary in diameter from about 1 to 6 ins., the edges being raised and of low vitality, and the floor covered with blood-stained exudate and foul-smelling debris. In many cases tendons protrude and are necrosed, and in some the bone is exposed and possibly dead or dying. Bacteriological examination showed a characteristic combination of Vincent's fusiform bacillus and a spirochæte. It should, however, be noted that each of these organisms has been regarded as accidental contamination, *e.g.*, by Mendelson (1918) in the case of the spirochætal infection, and Mei (1920) in the case of Vincent's bacillus.

(ii) *Associated Conditions.*

(*a*) *Trauma.*—In 125 cases, for which histories were obtained, trauma was said to have occurred in 92. Among farm labourers a prick by hard sisal leaves was the commonest injury. Such slight injuries must, however, be of almost daily occurrence in natives with bare feet and legs, either in the bush in the case of those in the reserves or in labour gangs, more especially on sisal plantations. There appears from the replies to the questionnaire on this subject to be a concensus of opinion amongst medical officers that immediate treatment of injuries, however slight, leads to a decrease in the occurrence of ulcers, and protection of the feet and legs greatly reduces the number of cases. While, therefore, it must be admitted that slight injuries do doubtless precipitate the development of ulcers and determine their location, it is difficult to believe that they are the sole cause. Indeed, there appears to be a general impression that, although trauma may be the immediate exciting cause, there is an underlying condition which predisposes to the development of ulcer, and retards its healing. Malaria, syphilis and intestinal parasites have been suggested as predisposing causes.

(*b*) *Malaria.*—It has frequently been stated that the incidence of tropical ulcer shows a close parallelism with that of malaria. In the present investigation, 123 ulcer cases were examined for malaria, and 28, i.e., 22·8 per cent., were positive. According to observations by Colonel James (1929), the proportion of native children whose blood contains malaria parasites may vary from 33 to 80 per cent., and Brennan (1926) found in Kisumu that of 1,000 slides examined for malaria parasites, 507 were positive. Anderson, T. F. (1929) in Teita found the incidence of malaria in adults to be 30 per cent., and Ross (1929) in the Kavirondo Reserve, found an incidence of 35 to 50 per cent. in the general population. It is obvious that, in the cases studied, the incidence of malaria was not higher than that in the general population.

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From the replies to the questionnaire issued by the Medical Department, it is difficult to establish any correlation between malaria and ulcers, the incidence of malaria in ulcer cases, as stated by different correspondents, varying from 0 to 100 per cent. As far as this brief study goes, there is, therefore, no evidence that malaria is an important predisposing cause of ulcer.

(*c*) *Syphilis.*—It has been suggested by some writers, *e.g.*, Stitt, that most cases of tropical ulcer are syphilitic in origin. In the present study of 123 cases, 15 per cent. showed a positive Wassermann. The following table shows how this compares with the percentage of positive reactions in sections of the general native community examined :—

Subjects.	*No. examined.*	*Percentage with definitely positive Wassermann.*
Kenya police	55 ..	29
Prisoners in Nairobi Gaol ..	100 ..	43
Ulcer cases from Kisumu ..	165 ..	55
Ulcer cases at native hospital ..	123 ..	15·4

It has to be remembered that a positive Wassermann is found in cases of active yaws. As far as these figures go, therefore, there does not appear to be any correlation between incidence of syphilis and that of ulcers. This is in accordance with results obtained by Halpin (1918), who found only one positive Wassermann in a total of 35 cases examined, and with the observations in Cocos and Perim of Edge (1921), who found no correlation between syphilis and ulcers.

(*d*) *Intestinal parasites.*—In 122 cases examined, 78·7 per cent. were found to be infected with intestinal parasites. Helminthic infection was found in 73·8 per cent. of the cases. These figures are compared in the following table with the incidence as determined by Callanan (1927) in 1,000 cases in the native hospital, including ulcer cases :—

	General hospital cases (including ulcers).	*Ulcer cases.*
Intestinal parasites ..	75 per cent.	78·7 per cent.
Helminths	65·8 „	73·8 „

There is a higher incidence of intestinal parasites, especially helminths, in ulcer cases, but it is doubtful whether the difference is significant. The incidence of intestinal parasites in the general native population varies rather widely. Ross (1929) in the Kavirondo Reserve found the incidence varying from 27·5 to 70·6 per cent. Philip (1927, 1, 2) in the Wateita found an incidence of 61 per cent. in the general population and 97 per cent. in 34 coast prisoners. Briscoe (1929) found 57 to 82 per cent. infected amongst the Wakamba.

14:Orr & Gilks D-4 (no date) 1931 FL12 Masai FL12
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Hence the incidence of parasites in ulcer cases is not conspicuously higher than in the general population, and since in 22 per cent. of the ulcer cases the presence of intestinal parasites could not be demonstrated they cannot be regarded as an important etiological factor.

(*e*) *Tribal, sex, and seasonal incidence.*—The most outstanding feature with regard to the tribal incidence of ulcer is that brought out by the survey (p. 34), namely, the high incidence amongst the Kikuyu, and the relatively low incidence amongst the Masai. This is confirmed by the replies to the questionnaire which state that true indolent ulcer is rare amongst the Masai but common amongst the Wakamba, Kavirondo, Kikuyu, Luo and Lumbwa tribes. Ulcer is relatively uncommon also in the Swahilis. We have not sufficient evidence to enable us to say whether racial differences can be correlated with ulcer, but the prevalence of the condition throughout the tropics makes this appear unlikely. With regard to diet, the difference between the Masai and Akikuyu has already been discussed in the first section of this report, and it is known that the Swahili have a mixed dietary. The diets of the other tribes mentioned above, in which ulcer is common, are somewhat similar to that of the Akikuyu.

As regards sex incidence, of the 140 cases studied in this investigation only 3 were women. This however cannot be taken as any indication of the relative incidence in the two sexes, since a high proportion of the cases in Nairobi Hospital are derived from labour gangs. Of the replies to the questionnaire which dealt with the question of sex incidence, 5 stated that ulcer is more common among men, 2 among women, and 4 that there is no sex difference. Among the subjects weighed and measured by the field worker, there were more ulcers in adult females than in adult males, but among the children examined, ulcers were more common in the boys. In the Kikuyu Reserve at least, the women do most of the hard work and are consequently likely to be more exposed to injury than the men. On the whole, the balance of evidence seems to point to a somewhat higher incidence amongst men than amongst women.

It is interesting to note that the admissions of ulcer cases to hospital commonly increase just as the long rains break. This is a season when disease amongst cattle is said to be more frequent. Since the growth of vegetation, and consequently the diet of both cattle and natives is affected by the rainfall, the high incidence of ulcer at the end of the dry season suggests the implication of a dietary factor.

Indirect evidence in the same direction is afforded by Breinl's (1915) survey of disease in British New Guinea. He found that there was a marked regional difference in the incidence of ulcer depending on the use of sago as the staple article of diet, and the consequent frequent slight injuries from the spines on the leaves and

14:Orr & Gilks D-4 (no date) 1931 FL12 Masai FL12
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trunk of the sago palm. Although Breinl gives no details regarding the dietary, we know from the work of Cilento (1926) and Strong (1927) that the food of the natives of New Guinea is chiefly carbohydrate, and that the general condition and health is poor. Edge also considers that dietary deficiencies play an important part in the etiology of ulcer.

Such information as could be collected in the present study of the etiology of ulcer seems to warrant the tentative conclusion that neither malaria nor syphilis can be regarded as causative agents. The influence of intestinal parasitic infestation, if any, is not prominent. Trauma is probably an important exciting cause, superimposed upon a condition of low resistance, which is probably the most important factor, in as far as it decreases the natural healing powers and increases susceptibility to invasion by the characteristic micro-organisms. This condition of low resistance may possibly be correlated with dietary deficiencies.

(iii) *Effect of Dietary Treatment on Rate of Healing.*

The effect of various additions to the diet on the rate of healing was studied in 140 cases. These were divided between two wards to facilitate the treatment. The ordinary hospital diet (p. 20) was used as the basal diet. The additions consisted of tomatoes, lemons, cod liver oil, a mineral mixture similar to that used in the prison metabolism experiments, and milk. These additions were, at one time, given all together, later the tomatoes, lemons, cod liver oil and mineral mixture were given in one ward, and milk in the other.

In addition to the dietetic treatment, the routine hospital treatment, consisting of saline baths, eusol dressings and fomentations, and, where indicated, scrapings, was continued.

The patients were weighed regularly, and daily clinical notes were taken of the general condition of the patients and the rate of healing of the ulcers. This material does not lend itself to statistical treatment. All that can be given is a descriptive account, with the conclusions reached by the observer from the mass of detailed data recorded in the course of the investigation.

In the first period, all the supplements referred to above were added to the hospital diet for one ward. This was followed by an improvement in general condition of the patients, increase in weight, and " according to the general impression " of the observer, more rapid healing of the ulcers. Later, the milk ration was withdrawn from this ward and given to the control ward, after which no detectable difference was noted in the rates of healing in the two wards. The milk appears, therefore, to have been of as much value as all the other supplements together.

The observer emphasises the fact that in no case, either with the supplements all together, or separately, was there any dramatic improvement in the rate of healing. The only conclusion possible

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was that the supplements improved the condition of the patients, and pari passu with this improvement there appeared to be a more rapid healing of the ulcers.

This conclusion is supported by a consideration of the gains in weight of the patients and the number of weeks required for recovery, a comparison of which affords the only quantitative measure of the effect of supplement feeding. The data are shown in the following table:—

Age.	20–22.	Over 25.	Under 18.	23–25.	17–19.
Number in group	6	23	32	11	19
Gain per man per week in oz.	13·3	12·8	10·6	8·8	8·4
Weeks to recover	8·3	10·2	10·5	11·7	12·9

It will be seen that the rate of increase in weight is not correlated with the age of the subjects.

The conclusion cannot, however, be taken as more than an indication, since it cannot be assumed that all cases were at the same stage and of the same degree of severity, and since some were discharged before healing was complete.

The dietary tests, therefore, showed that none of the substances tried had any marked effect on the rate of healing, but that the rate of healing appeared to be correlated with the general condition of the patients.

(iv) *Blood Examinations in Ulcer and Non-ulcer Cases.*

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In order to ascertain whether ulcers could be associated with any constant deviation from the normal in the composition of the blood or in physiological adjustments, the calcium and inorganic phosphorus content of the blood were estimated, the sugar tolerance and blood pressure determined, and blood counts made in a number of ulcer and non-ulcer subjects.

(a) *Calcium content.*—Estimations of serum calcium were made on 90 prisoners and farm labourers not suffering from ulcers, and on 57 ulcer cases, with 13 Europeans as controls. The following figures show the ranges and averages:—

Serum Calcium—mg. per 100 c.c.

Class of case.	No.	Range.	Average.
Prisoners and farm labourers ..	90	7·3 to 11·0	9·4
Ulcer cases	57	7·0 to 11·2	9·7
Ulcer cases on admission	46	7·0 to 11·2	9·6
Ulcer cases on discharge	11	9·7 to 11·2	10·3
Europeans	13	10·7 to 12·5	11·2

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of blood for phosphorus determinations, 15 gm. urea being given in each case :—

Urea Concentration Tests.

Inorganic P.		Hours after administration of urea.			
		1.		2.	
Ulcer case.	Mg. per 100 c.c.	Urine vol.	Urea.	Urine vol.	Urea.
		c.c.	%	c.c.	%
1	4·17	310	0·85	130	2·54
2	4·72	200	1·16	80	3·00
3	4·08	162	1·86	72	4·00
4	5·26	115	2·00	70	4·37
5	6·02	610	0·78	80	3·90

It will be observed that the concentration of urea is within normal limits, being in all cases over 2·0 per cent. in the second hour (the accepted standard, Maclean, 1924). Hence the very high blood inorganic phosphorus in ulcer cases cannot be attributed to renal insufficiency. The general fact of an increase is, however, in agreement with what we have seen to occur with diets ill balanced in having an excess of phosphorus and deficiency of calcium.

(*c*) *Sugar tolerance.*—In 34 subjects, of whom 16 were ulcer cases, the sugar tolerance was investigated. Tests were also made on three Europeans as a control against the possible effect of climatic conditions.

The detailed results are given in Appendix 3. Graph 11 shows the nature of the results obtained. It will be seen that the Europeans conform fairly closely to the standard curve. The natives, on the other hand, show a distinct lag. This is in agreement with tests on Indians by Bhatia and Coelho (1925), who found that those accustomed to a vegetarian diet, chiefly carbohydrate, showed a lag in the rate of return to normal after ingestion of glucose. There is little difference between the curves for ulcer and non-ulcer cases.

(*d*) *Blood pH and alkali reserve.*—It was intended to investigate the pH and alkali reserve of the blood but, owing to delay in the transit of apparatus, the work had just begun when Dr. Henderson became ill. The only available data are a few preliminary observations on the pH, which showed no marked deviation from the normal.

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(*e*) *Blood-pressure.*—Blood-pressure estimations were made on a number of Kikuyu, both on indoor and outdoor work, and on ulcer cases. With these were compared estimations on natives belonging

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to other similar tribes, on Masai and on Europeans. The following table summarises the results :—

Blood-pressure—mm.

Tribe.	Kikuyu in-doors	Kikuyu out-doors	Kikuyu all	Others in-doors	Others out-doors	Others all	Masai	Europeans	Ulcer cases
Number	40	14	54	31	15	46	28	18	31
Average age	29	28	28	24	32	27	28	29	19
Systolic	110	119	112	111	123	115	117	118	98
Diastolic	76	82	77	79	87	82	79	75	64
Pulse P.	34	37	35	31	36	33	38	41	35
Weight, lbs.	127	130	128	132	128	128	133	—	—

The figures for Europeans correspond fairly closely with the normal standard, with a tendency to be slightly low. This is in agreement with other observations (Breinl and Young, 1919-20: Roddis and Cooper, 1926: Fleming, 1924). The ulcer cases are definitely lower than non-ulcer, and statistical analysis showed the difference to be significant. There is, however, a difference in average age between the two classes, which may account for at least part of the difference in blood pressure. Analysis of the data shows that there is little difference between ulcer cases over 20 years of age and those under 20, the former giving an average of 99 mm. and the latter 98. It is probable, therefore, on the whole that blood pressure may tend to be low in ulcer cases. It is most likely that this depends not so much on the ulcer *per se*, as on the lowered vitality and restricted activity of the patients.

(*f*) *Blood cell counts.*—Cell counts were made on 28 ulcer cases with 21 non-ulcer cases and eight Europeans as controls. The results were as follows :—

	Europeans.	Non-ulcer natives.	Ulcer cases.
Leucocytes	10,725	9,590	11,978
Erythrocytes	5,835,000	5,590,000	5,687,000
Hæmoglobin	91·5%	86·0%	81·2%
Colour index	0·95	0·92	0·85
Polymorphs	64·5	47·0	41·0
Lymphocytes	27·5	41·0	45·0
Large mononuclears	4·2	4·2	7·1
Eosinophiles	4·0	7·1	5·1

There was a lymphocytosis in all natives, ulcer and non-ulcer cases. In ulcer cases the hæmoglobin was somewhat low, but the difference is probably not significant. A diminution in polymorphs and increase in eosinophiles has been observed by others in Europeans in the tropics (Breinl and Young, 1919-20).

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(v) *Conclusions.*

In all these blood examinations, the only outstanding point of difference between ulcer and non-ulcer cases is the high inorganic phosphorus in the blood in ulcer. It is of interest to consider the calcium and inorganic phosphorus results together :—

	Serum calcium, mg. per 100 c.c.	*Inorganic phosphorus, mg. per 100 c.c.*
European standards ..	10·0 to 10·5	.. 3
Europeans in Kenya ..	11·4	.. 3·43
Non-ulcer natives ..	9·4	.. 3·68
Ulcer cases	9·7	.. 4·55

It appears very unlikely that the alteration in balance of calcium and phosphorus in the blood of the natives should be in any way due to environmental influences, since both elements are increased in approximately the same proportion in Europeans. We have already seen that a shift in the direction of high phosphorus, low calcium, occurs in experimental animals on diets containing an excess of phosphorus and deficient in calcium, and the lack of balance in the native dietary, which is closely similar to these experimental diets, would suffice to explain a high phosphorus and low calcium content in the blood. It does not, however, explain the difference between ulcer and non-ulcer cases, for the ulcer cases are so much higher in inorganic phosphate than the non-ulcer that their calcium would be expected to be significantly lower. Instead of being lower, it is at least as high.

It would be of great interest to know whether in the individual case a rise in calcium or phosphorus occurs subsequently to the development of ulcer, and also whether any change occurs in the form in which calcium is present in the blood. It has been suggested by Greenwald and Gross (1925) that part of the calcium may normally be held in solution in the blood as calcium phosphate, which would be physiologically inert. An increase in this fraction might be thought to occur. Further, Ashford and Hernandez (1926), in analyses of the blood of over 500 subjects in Porto Rico, report that blood calcium is low, relatively to accepted standards, especially in cases of " nutritional unbalance," and that the decrease is chiefly in the diffusible fraction.

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It is stated that tropical ulcer cannot be produced by experimental inoculation of the characteristic organisms unless an artificial necrosis of the skin is first produced. (Blanchard, 1914 ; Breinl, 1915.) It does not occur in Europeans, according to Edge (1921), except where the diet is restricted. It would be of the greatest interest to know whether it could be experimentally produced by inoculation of the organisms into animals in which the composition of the blood had first been altered by feeding an ill-balanced, high phosphorus, low calcium diet.

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146 In the absence of further information, it can only be said that the results of this investigation suggest that susceptibility to ulcer, which appears to be general amongst natives on ill-balanced diets of the type mentioned, is correlated with a high blood inorganic phosphate, occurring with a normal, or slightly subnormal calcium, and that the actual occurrence of ulcer is associated with an exaggeration of this abnormality.

IV.—SUMMARY OF RESULTS.

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146 Preliminary observations and a review of existing information
164 suggested that disease is more prevalent amongst native races than is generally supposed, and indicated that the incidence of certain diseases might be correlated with diet.

A survey of two tribes, the Masai and Akikuyu, showed that the diet of the former consisted to a large extent of milk, meat and raw blood, and that of the latter mainly of cereals, roots and fruits, the bulk of the diet being cereals. The outstanding points of difference in chemical composition of the two diets were that the Masai have a relatively very high intake of protein, fat and calcium, while the Kikuyu have a high intake of carbohydrate and a low one of calcium. Differences were found in the dietary customs between men and women in both tribes, the diets of the females approaching in each case to the mean between the diets of the males.

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[141] Physical measurements showed that the full-grown Masai male is on an average, 5 inches taller and 23 lb. heavier than the full-grown male Kikuyu, and his muscular strength, as determined by the dynamometer, is 50 per cent. greater. Marked differences were found in the incidence of disease in the two tribes, bony deformities, dental caries and anæmia, pulmonary conditions and tropical ulcer being much more prevalent amongst the Akikuyu. On the other hand, intestinal stasis and rheumatoid arthritis were more common amongst the Masai.

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[146] Analyses showed that routine Hospital and Prison diets are markedly deficient in calcium, the average daily intake being only about 0·3 gm. Ca, as compared with the assessed requirement of about 1 gm.

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147 Examination of the blood of Kikuyu and other natives on a similar dietary showed that the concentration of calcium was lower than the European standard, the average of 90 cases, prisoners and farm labourers (not pathological) being 9·4 mg. per 100 c.c. serum, as compared with 10·0 to 10·5 mg. in Europeans at home, and 11·4 mg. in 13 Europeans in Kenya. The range of variation in blood calcium was wide, from 7·3 mg. to 11·2 mg., the highest figure being below the mean for Europeans in Kenya.

MK 196 whether, if the milk had been continued, there would have been a difference in adult stature. The results of the measurements of the Kikuyu and Masai at first sight suggests the latter alternative. But, MK [199] although there has been a good deal of intermarriage between the two tribes, they were originally of different stock, and we have no information as to whether, or to what extent the differences in stature and physique may be inherited characters. It would be an interesting study to correlate diet and stature in different countries, to ascertain whether any correlation exists between the quality of the diet and mean adult stature.

MK 164 196 K [199] There are differences in the incidence of disease in the two tribes, and one of the tribes, the Akikuyu, show abnormalities in the composition of the blood. The diet of this tribe is very rich in carbohydrate, relatively rich in phosphorus, but deficient in calcium. Experimental data have been brought forward to lend support to the suggestion that deficiencies in the diet, abnormal composition of the blood and reduced susceptibility to certain diseases which have been noted in this tribe, may be correlated. The possibility that diet may influence the susceptibility to certain infectious diseases raises one of the most important problems in nutritional research.

MK 196 With regard to the bearing of the results of the investigation on conditions in Kenya, we are probably justified in concluding that the diet commonly in use amongst the Akikuyu and other tribes of similar customs is badly balanced, being too rich in carbohydrate and deficient in calcium. It is probably deficient also in other substances required as constructive material for growth, and in certain of the vitamins. On the other hand, the Masai, with a diet at the opposite extreme, possibly have too little vegetable food rich in carbohydrate and cellulose. Improvement might be brought about by increasing the use of green vegetables by both tribes, and of milk by the Akikuyu.

ooo The problem is therefore one which concerns not only medical and public health, but also agricultural authorities. A general improvement of agriculture and animal husbandry amongst the Akikuyu will almost certainly be accompanied by an improvement in the health and working capacity of the natives themselves.

This problem is not confined to Kenya. It appears to exist in many different areas in our tropical dependencies. It may be judged from the introductory statements in the early part of this report that the loss of health and efficiency attributable to deficient diet is, therefore, of considerable economic importance.

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TABLE VII.

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Table showing Percentage Incidence of Diseases in Children.

	Per cent.
(1) *Bone Abnormalities.*	
Kikuyu boys	62·6
Kikuyu girls	43·7
Masai boys	11·7
Masai girls	14·6
(2) *All Dental Defects.*	
Kikuyu boys	40·0
Kikuyu girls	28·8
Masai boys	8·3
Masai girls	7·3
(3) *Caries alone.*	
Kikuyu boys	13·7
Kikuyu girls	13·1
Masai boys	1·6
Masai girls	3·6
(4) *Spongy Gums.*	
Kikuyu boys	61·8
Kikuyu girls	52·6
Masai boys	15·0
Masai girls	22·0
(5) *Anæmia.*	
Kikuyu boys	47·8
Kikuyu girls	38·9
Masai boys	11·7
Masai girls	8·5
(6) *Enlarged Tonsils.*	
Kikuyu boys	56·0
Kikuyu girls	53·3
Masai boys	35·0
Masai girls	52·4
(7) *Cervical Adenitis.*	
Kikuyu boys	52·0
Kikuyu girls	47·6
Masai boys	40·0
Masai girls	59·8

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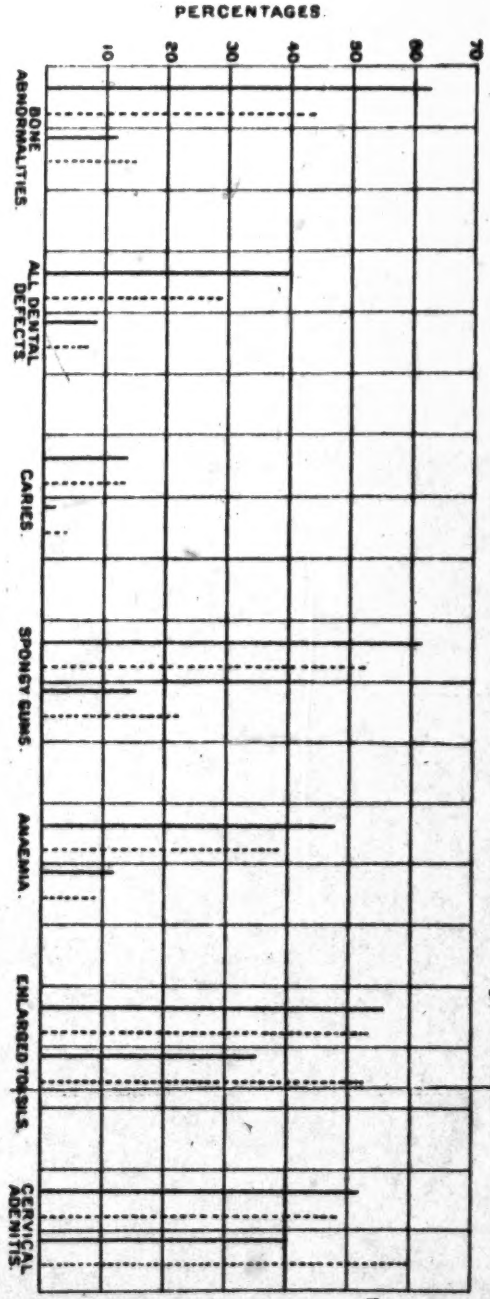

[End Graph J]

GRAPH IO.

Graph showing percentage incidence of diseases in Masai and Kikuyu children.

——— Kikuyu boys.
------ " girls
——— Masai boys.
------ " girls.

/179 cont./

Infectious Diseases

757 • 164 For dysentery (eŋg ga en gohŏge os sarge) the sick one is given much liquid sheep-fat or melted butter to drink.

Malaria (eŋg odjoŋgáni). At the start of the chill, the patient is given an emetic, for example, a cold, strong extract of the bark of ol mokotan (Albizzia anthelmintica). Even before the fever breaks out, a decoction of os sogonoi bark is administered, through which, in many cases, the outbreak of the fever is supposed to be prevented or alleviated.

753 825 It is interesting that the Masai -- so they say -- have always regarded the bite of the mosquito as a prerequisite for an attack of malaria. They say that the latter, with its bite, inoculates the person with a poison that causes malaria. For this reason they never [361] lay out their kraals in the vicinity of a swamp or other standing water, and also avoid those places in whose surroundings during the rainy season longer standing puddles form. /180/ In order to drive away the mosquitoes they burn (in the camp or in the hut) the peppermint-scented ol eŋoroŋ (Plectranthus Merkeri, Gürke). If a kraal is badly afflicted with mosquitoes, its inhabitants leave it immediately out of fear of fever (1).

1. So they told me as early as 1895. When, at the beginning of 1896, Zendeo with a number of his people came to Moschi, I received in reply to my question as to whether they had to suffer much with fever the answer: "No, there are no mosquitoes near our kraals."

757 Other emetics are: root powder of ol aisai (Cyathula Lindowina Vlks.), which is taken stirred in water; a decoction of roots and stalks of ol gurschaschi (Barleria mucronata Lindau); a root decoction of ol moran (Solanum nigrum); the boiling down of a handful of bark or root of ol duŋgui (Harrisonia abyssinica Oliv.); a cold extract of five finger-size pieces of the bark of olti (Acacia mellifera Bth.)

/180 cont./

757 and the chewing of the root of ol saajét (Withania somnifera Z.) are regarded as acting especially vigorously. Children are given an infusion of the leaves of ol magingi (Moschosma multiflora [Hoch.] Bth.), because it has a considerably milder effect.

753 757 They call another greatly feared fever ol oirobi l'en duhúr and see its original cause in the bite of a kind of tick living underground, which they designate as en duhúri jámon. The patient is given liquid sheep fat mixed with the powdered grains of ol odoa (Maesa lanceolata Forsk.). Presumably this fever is identical with relapsing fever, for [136] [164] which Professor Robert Koch identified as the carrier of the spirilla a species of tick living underground (Ornithodorus Lahigni) (2).

2. During the day Ornithodorus hides in cracks of buildings or in the ground and emerges as soon as a victim approaches. Merker's conjecture could therefore correspond to the truth, and the more so since to me too the Masai designated and displayed an unquestionable Ornithodorus as the carrier of a fever. The ed. Dr. S.

757 [164] Against chickenpox (e riri or en diabobon) no medicine is known. The sick person remains in the hut, is given as a drink a little milk mixed with fresh blood and sheep-tail fat, two things that are regarded as strengthening; furthermore, as food, a piece of mutton roasted in the skin at the open fire.

[751] [164] [758] For protection against smallpox (ol maschúgu or ol minjaloi) healthy persons are inoculated in two incisions on the forehead with the smallpox pus en gimék) of a sick person. Smallpox patients are given a decoction of the roots of en dulele (Solanum campylacanthum) mixed with cattle blood as a diaphoretic and at the same time a nourishing remedy. In order to increase the sweat secretion, the patient is laid beside the hearth fire. Diet; no drink except the above-mentioned medicine; as food, the head of a sheep roasted in the skin or another piece of mutton similarly prepared.

/180 cont./

757 Elephantiasis scroti (en dorenge) is regarded as a punishment of
753 God for incest committed. A therapeutic treatment is unknown.
• [64] Other forms of elephantiasis are said not to occur among the Masai; the one mentioned seems to be infrequent to the point of having disappeared.

757 /181/ To cure the parasitic cutaneous eruption (1)

> 1. The eruption heals within three days if the affected places on the skin are well covered with a noninritating salve (for example, zinc ointment), after they have been previously cleaned with soap.

(el bebedo) called upele by the coastal people, the body is rubbed with oil obtained from the ol dimuai tree (Commiphora sp.), whereupon healing follows in two to three days -- as I was able to find out for myself a few times.

164 I have never seen among the Masai the frambesialike schiwaki sickness (2)

> 2. Schiwaki is often mistakenly taken for lues. With the administration of potassium iodide the schiwaki sores heal in the course of two to three weeks.

very common on the Kilimandscharo. To a corresponding question I always received the answer that this very infectious disease is unknown to them.

Ailments of the Respiratory Organs

757 Against head colds (ol oirobi l oñ gumeschi « cold of the
[64] nostrils) one snuffs tobacco mixed with the powdered bark of the en doroniki tree. In severe cases, as a diaphoretic, one administers the juice of the tuber of ol amboschi (Momordica cardiospermoides Kl.) or a decoction of eng aitetoijai kete (Aneilema Johnstonii K. Sch.).

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Bronchial catarrh (es sedja eń geroget = cough). The patient is given a handful of the powdered bark of ol marbait (Croton spec.) stirred into fresh cattle blood, or a paste that consists of a third of a liter of liquid honey and two handfuls of the powdered bark of os sogonoi. A decoction of the bark of ol okiteni is supposed to have a loosening effect; for the same purpose one also chews the bark bast of ol debbe (Acacia Merkeri) and of ol bararuai or ol bariroi (Lonchocarpus Bussei spec.), and eats the unripe fruits of ol amriake (?). The mother gives small children the juice obtained by chewing a species of Fagara (ol oisuggi) or ekum (Spilanthus Acmella L.) or the leaves of eń gawarna (Cluytia Kilimandscharica Engl.).

Ailments of the Digestive Organs

For nausea one drinks a decoction of the bark bast of ol bararuai (Lonchocarpus Bussei sp.) stirred with liquid sheep-fat, or one takes an emetic, such as: stronger than the ordinary doses of ol mokotan, ol odoa (Maesa lanceolata), ofti (Acacia mellifera).

Diarrhea and abdominal pain (ekwet eń gohǒge or eń gorotik, the latter word designates the watery excrement). To check it, one drinks extracts or decoctions of the bark of ol bugoi (Terminalia Brownii Fres. var. Merkeri Engl. and Terminalia Hildebrandtii Engl.) or of ol nai (Acacia spirocarpa Hochst.). In addition, bark extracts of ol ńaǹboli (Ficus Sycomorus), a decoction of the bark of os sagararám (Bauhinia reticulata D. C.), of the root /182/ bark of ol amai, goat-meat broth in which a few pieces of the root of ol ama (Ximenia americana L.) have been boiled, or a root extract of ol amerori mixed with milk. The powdered bark of ol ugunonoi (Heeria pulcherrima) stirred into fresh milk is regarded as a quick and sure remedy. For abdominal pains a decoction of ol gbǵnia (Cassia obovata coll.) is administered, or a leaf extract of ol magutugut, also called ol magingi kete (Clerodendron discolor [Kl.] Vtke.). Because of its mild action, the extract or decoction of a Commiphora species (o'ropande) mixed with beef bouillon or an infusion of the leaves of os siteti (Grewia bicolor Juss.) is popular. Pregnant women
000 prefer this medicine to the ones previously mentioned. In order to

751 /182 cont./ In order to avoid the onset of a case of diarrhea as a consequence of the very popular copious enjoyment of liquid fat, a root decoction of the above-mentioned ol ama tree (Ximenia americana L.) is administered.

752 044 Constipation (ol gólomi). The most popular remedies in severe cases are a decoction or extraction of the bark of ol jani 'njugi (Embelia kilimandscharica Gilg) mixed with fat, or, in milder cases, the pepperlike grains of ol odoa (Maesa lanceolata Forsk.), which are chewed.

827 Regarded as aiding digestion is the bark of ol mata (Thespesia Garckeana F. Hoffm. and Dombeya reticulata Mast. vel aff.), of en demgscho, also called ol egúrugi (Turraea Volkensii Gürke), which is drunk mixed with meat broth, and of a still unknown Acacia species (ol alili), which is why the warriors, during their meat feasts, add these powdered barks to their drinking water, as well as an extract of the pounded root of ol gbulót (Bridelia cathartica Bert).

"To clean out the stomach" the warriors take, once every three or four months, a medicine called en janigitti, consisting of the bark decoction of ol odoa (Maesa lanceolata), ol mokotan (Albizzia anthelmintica), ol marbait (Croton spec.), ol jani 'njugi (Embelia kilimandscharica Gilg), ol getalassua (Myrica kilimandscharica Engl.), os sugurtuti or ol dinjai (Cissus quadrangularis).

826 As Tonicum roborans /strengthening tonic/ and beautifying agent, pulverized bark of ol dímigómmi (Pappea capensis Eckl. et Zeyh.) is added to the drinking water. It is supposed to make the skin softer and more elastic, as well as to give rise to an increase in the padding of fat through which sharp contours are rounded. The remedy is especially popular among warriors.

752 164 For liver pains (aia e munjwa) one drinks a decoction of the bark of os sodjo (Enclea fructuosa).

For spleen pains and spleen swelling (aia ol dassín), the powdered bark of the same tree, stirred to a paste with honey, is eaten or, mixed with honey beer, is drunk, as is a root decoction of os senetoi (Cassia didymobotrya Fres.), which as a rule is mixed with milk.

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752 164 Liver and spleen abcesses are supposed to be cut open to drain off the pus. I saw scars in the areas in question several times, but was never able to observe the operation itself.

757 164 For so-called bilious fever (ol odoa = the gall), an emetic is taken first, either a strong dose of grains of the ol odoa (Maesa lanceolata) or a bark extract of ofti (Acacia mellifera); then one drinks a root decoction of ol deregeli (?) or of ol manuai (?).

To get rid of intestinal worms (taeniae [ol gurto, el gurt] and ascarids [ol budi, el budok]) one uses decoctions of the bark of ol mokotan (Albizzia anthelmintica), of the root of ol deregeli (?), of the fruits of ol odoa (Maesa lanceolata), or also of the powdered bark of ol jani 'njugi (Embelia kilimandscharica Gilg), the latter of which is always taken with fat since otherwise it is too acrid and easily causes violent abdominal pains with diarrhea.

To cure ancylostomiasis (eig ĝa ei gijábe) one administers a decoction of the bark bast of ol mokotan (Albizzia anthelmintica); the bark bast is cooked with meat; the patient drinks the meat broth.

Venereal Diseases

757 [164] [548] Gonorrhea and especially lues are quite rare among the Masai. This is due in part to the absence of professional prostitution, and in part to the fact that the Masai are familiar with the dangerousness of these diseases and their easy transmissibility. Those stricken with lues are segregated and may not enter any kraal until the external symptoms of the illness have disappeared; during this time they live outside the kraal in a superficially built hut surrounded by thorn branches for protection against predatory animals. Accordingly lues is called eńg ĝa auló, formed out of eng ĝa = the sickness, auló = outside the kraal. Lues patients drink a great deal of liquid fat and liquid butter for a cure. One drips on the lues ulcers, as well as on [439] those of the chancres, juice of the leaves of ol aisigirai (?), sprinkles on them a powder made out of the leaves of ol agaramóni (?), or burns them with Cuprum sulfuricum, which the Masai obtain in trade with caravans.

/183 cont./

757 For gonorrhea they use a whole number of medicaments, to some of which they attribute only or chiefly a diuretic effect, to others a healing effect as well. The principal remedies are the following: decoction of the bark of ol jani 'njugi (Embelia kilimandscharica), often mixed with calf urine; furthermore of os sagararam (Bauhinia reticulata), ol debesi (Acacia cfr. verrugia Schwfth.), ol mokotan (Albizzia anthelmintica) and ol gelai (?); a root decoction of the latter is also used, as well as of ol orondo (Cissus sesquipedalis Gilg), ol assasiai (Osyris tenuifolia Engl.), ol dorotua, and, finally, decoctions of the dried root bark of o'remit (Salvadora persica) and of the wood of a Rhus species (ol mesigie kete), which is regarded especially as a diuretic.

[164] /184/ For cystic catarrh one drinks a weak decoction of the root of o'remit (Salvadora persica).

832 A bark decoction of ol dimigómmi (Pappea capensis) is regarded as an aphrodisiac for men, one made out of ol mokotan (Albizzia anthelmintica) for women. The bark of the trees ol giloriti (Acacia [263] abyssinica) and ol okiteni, used as seasoning for meat broth, is supposed to have the opposite effect among the warriors.

These last two remedies, however, are by no means regarded [147] as sedatives, but, on the contrary, as stimulants. The people explain the effect ascribed to them here with the words: the warrior does not like the odor of the girl, by which probably a specific foetor urinae /stink of urine/ more or less clinging to the clothing of all women is to be understood.

Nerve Ailments

757 With headache (eńg ga ol ogunja) a blister is produced on each [164] of the temples and on the nape with the fire twirler (ol biron) rubbed hot; more rarely one ties a cord rather tightly around the forehead [177] and the occiput. The latter remedy is not peculiar to the Masai, but has been adopted in places from other peoples.

[164] For earache (eńg ga ŏŭ gia) one pours warm butter into the ear.

/184 cont./

757 With toothache (eńg ga ol alai) one bites on a very hot residuum [164] of fat with the aching tooth. Pieces of twigs of o'remit (Salvadora [515] persica L.) and ol abalasas (Dodonaea viscosa L.) chewed to resemble a brush at one end serve as toothbrushes.

[562] For rheumatic pains in the muscles one makes use of massage, which is practiced by the women, or one makes poultices with the pulp of the pulverized root of o'remit (Salvadora persica), which [593] also finds use otherwise as a "mustard plaster." Married men have [385] themselves massages by their wives to get rid of pains in the leg muscles after long marches, whereas the warriors scorn this help as unmanly. Furthermore one administers a root decoction, preferably mixed with a broth from steer meat, of o'rarait (Cissus rotundifolia [Forsk.] Vahl.) or of ol logíono (Pentas zanzibarica [Kl.] Vtke.), or also a decoction of the wood of ol gonjél (Rhamnus prinoides l'Herit.). For rheumatic pains in the back one drinks a root decoction, sweetened with honey, of ol asasia l os subertai (Osyris tenuifolia Engl.). To cure articular rheumatism a root decoction of ol ogíno (Boerhavia diffusa L.) is administered. Besides these remedies, those that are regarded as diaphoretic, especially the above-mentioned ol amboschi (Momordica cardiospermoides Kl.) and eńg aitetoijai kete (Aneilema Johnstonii K. Sch.), are also given.

276 Other than for curative purposes the warriors regularly, and, to be sure, for the entire duration of their membership in the warrior [126] standing, take various nerve /185/ stimulants. These are taken especially on war expeditions and, even more, during the meat feasts forming the preparation for these. One of the most popular stimulants is the bark of the frequently mentioned ol mokotan (Albizzia anthelmintica). One pounds a piece of bark bast the size of two hand-palms with a club and then lets it steep for a few minutes in still hot meat broth. The other stimulants are: ol dinjai or os sogurtuti (Cissus quadrangularis); an arm-long piece is cut up and boiled in water. The extract is taken mixed with goat-meat broth. Equally strong in effect is the root of ol ońgrua (?). One takes a piece of root three centimeters thick and approximately ten centimeters long, chops it twice, and cooks it with beef broth. The decoction smells disgusting.

/189 cont./

757 means rare that two or three rows are cut for one operation. Most adult Masai have such scars in greater numbers; however, one also often finds people whose entire torso is literally covered with cupping scars. It seems as though the people like to avoid being cut twice in the same spot.

Upon swellings one puts the pulp, allegedly acting as a resolvent, of the chewed plant of ol agaramóni (Crossandra nilotica Oliv.).

752 757 •164 Abcesses, when they are ripe, are punctured with a small, pointed, double-edged knife and cut open only after the draining of the pus by pressure. Then the wound is washed out with tepid water and cleaned out, using the nail of the index finger, as well as possibly also the aforementioned knife, as a sharp spoon. Finally, one sprinkles on it a caustic powder made from the root of ol gneriandus l en doje (Plumbago ceylonica). The surgeon does not apply a bandage.

Abcesses of the mammary gland are merely punctured and emptied.

With panaritium the nail is removed and the wound washed out.

Suppurating lymph glands (ol gnarnari eti ñ gimek) are treated like abcesses, but the lymph gland is cut out before the application of the caustic powder.

An ailment called ol dododoi l en daré = goat ulcers (1)

1. This is most probably a matter of anthrax carbuncle.

by the Masai manifests itself in that the person afflicted has one, less frequently two, hard lumps the size of a hazelnut under the skin, tapering into a taillike point at the bottom. I saw these ulcers (em boroi) and their scars -- somewhat larger than a mark piece -- on the temples, on the chest, on arms, legs, and on buttocks. As [753] the original cause the people cite the eating of meat of goats or sheep that died of eńg ea nairogua = hot sickness (2).

2. Pulmonary anthrax.

758
757
[752] /189 cont./
The hard lumps are cut out. During the illness the patient is given a diet of meat roasted on charcoal and, as medicine, a decoction of the roots of ol demellua /190/ (Solanum setaceum) or ol oki with the addition of honey; a root decoction of eh gogi (Lycium cf. arabicum Schweinfurth) mixed with milk or meat broth or such of ol amelóki (Maerua Johannis Vika. et Gilg), which, as a rule, is mixed with a little honey or fresh livestock-blood, is also regarded as curative. The patient drinks this liquid when he is thirsty. The illness is supposed to lead to death if this diet is not adhered to and the patient takes in particular cold water or milk, as well as cooked meat. On the other hand, if the prescribed way of life is observed for two or three months, the lump, gradually pushing outwards, is said to fall off. Since, however, the continuous meat diet is too expensive and the herb medicines cannot be obtained without difficulty, the operation is preferred in by far the most cases.

752 A persistent fever connected with swelling of the three pharyngeal
• [164] tonsils, accompanied by violent coughing and considerable loss of strength, especially common in youthful age, the Masai call ert el muli = gland sickness. Very probably it is a matter of adenoidal proud flesh in the nasopharyngeal cavity. The patient turns to the surgeon to be cured. The latter, putting his hand into the patient's mouth, scrapes the pharyngeal tonsils with the nail of his index finger, or with a small knife, so strongly that they bleed profusely. A rather large number of people whom I questioned about the success of the cure asserted that they always could count on certain recovery. Two of my boys, Masai youths about 11 to 12 years old, fell ill with the above symptoms. In spite of careful symptomatic treatment, their recovery of strength was so unsatisfactory that, upon their request, I gave them permission to go to a nearby livestock-kraal in the steppe for relief. After eight to fourteen days they returned, healthy and refreshed, and told me, which corresponds to the truth, that the surgeon had treated them in the manner described.

Fresh, simple wounds (en dunoto, n dungot) are cleaned as was described above for the ulcers, but during this one tries to avoid unnecessary irritation, for fear of greater bleeding. On this account, many surgeons do not proceed with treating the wound until several

18: Merker--468 G-5 (1895-ca.1908) 1910 FL12 Masai FL12

/345 cont./

182 595 shareholder, the rest of the shares are in the hands of his wives, who acquire these shares through the birth of a son. Through this the wives, who have the duty to tend and care for the livestock, are interested in the preservation of the property in the most extensive way. This is the one factor of the polygamy of the Masai promoting prosperity with all its advantages for the political economy. The other lies in the fact that many women give birth to more sons for one man than one woman could. Here, however, male offspring are augmenters of the paternal property. The boy grows up to become a warrior and brings his family the spoils of the numerous raids, through which not only is the herd increased, but, through the supply of new blood, is also improved.

Polygamy among the Masai is therefore a natural institution. Without it large masses of women would be deprived of their natural occupation, a condition that seems impossible for a primitive people. It is, moreover, a source of prosperity, which, among a culture-poor nomadic people, can only make itself felt favorably for their preservation as a people. From it follows, first of all, good nutrition, [146] which makes the body resistant to the effects of illnesses. It corresponds to my observations that among the Masai in general, among [165] adults, fewer cases of death occur as a consequence of illness than [164] is the case among the Negroes living in their vicinity. Also, serious illnesses are more infrequent among them than among the former 182 847 and are milder in their course. The circumstance that abortion is practiced by the women in only very rare exceptional cases also undoubtedly acts to promote health. One can sufficiently observe the harm that this bad custom has often caused primitive peoples among the various neighbors of the Masai, though indeed there are also exceptions to this. Thus, I met a number of Dschagga women who went through this operation four to six times and allegedly, as well as apparently, without harm.

182 165 854 847 853 In contrast to the high fertility there is also a rather high child mortality, though infanticide is entirely unknown. It is definitely beneficial for the child that through work the mother is not kept outside the kraal, but can always remain in the vicinity of the child. The long nursing period of about two years is also advantageous.

/345 cont./

182 Harmful to the child's health, on the other hand, are the poor huts,
165 which are always /346/ filled with dense smoke, and furthermore
854 the lack of cleanliness and the faulty diet. The belief, widespread
[362] among all African primitive peoples, that fat gives strength and
[853] health leads to the stuffing of the baby, despite all its struggles and
146 screams, with unbelievable quantities of butter. Sour, as well as
856 stomach and intestinal affections, and ailments of the respiratory
[164] organs are therefore also the principal illnesses that carry off the
babies. If one compares the high mortality among children with the very low one in later life, and if one further considers that, in inspecting the Masai kraals, one finds almost only healthy people full of energy, one cannot resist the thought that the treatment of the children, especially the babies, unconsciously aims at culling out all the weak elements at an early age and preserving for the people only the most vigorous ones that are equal to the demands of life. Seen from this standpoint, that of natural selection, the high child mortality seems less unfortunate. Finally, the late age
182 at which the men enter their first marriage is unfavorable for popu-
582 lation increase. Until about the 28th or 30th year of life the Masai
837 belongs to the warrior standing, and he may marry only after leaving
837 it. This circumstance in turn makes free love, such as exists in the warrior kraals, an understandable social institution. One must judge this arrangement on the soil in which it grows, in order to remain objective. From the same standpoint we shall have to judge more leniently the free love existing among the married, which, despite numerous restrictions, appears to us like a continuous prostitution
[948] of the woman. One can do this all the more since through that professional prostitution is excluded here, and consequently the possibility of infection is greatly reduced; this last circumstance is undoubtedly to be regarded as people-preserving. Actually the Masai
[164] maintain that in former times (before the great livestock epidemics) venereal diseases only very rarely occurred. Immorality is rightly
182 regarded as a people-destroying factor, and history teaches us by
831 many examples how licentious and refined sensuality was one of the grounds that caused the decline of higher peoples. Here among the Masai, however, it is not a matter of this unnatural kind of

/349 cont./

178 241 that are started with as a rule and which one therefore finds in all the settlements. Yet despite the ease of production of the field crops, the transition to agriculture nevertheless is taking place in a way 178 182 that is reducing the population in extraordinary fashion. First of all, the acclimatization process slowly being accomplished demands a great sacrifice of human lives. The Masai, little afflicted with 149 165 fever in the dry steppes, suffers with it quite seriously in the moist regions in which mosquitoes are permanently at home. Thus on two occasions in the same new settlement I found all the adults and many children sick with fever. Another one had just been abandoned by its inhabitants, leaving the sick behind. The ones left behind, principally men and boys, were badly reduced by fever and, in addition, suffered to a great extent from virulent leg ulcers, whose great extent -- in many cases they covered the entire lower leg, from knee to ankle -- probably is to be traced back to a general weakening of the body by fever and lack of food: for such ulcers are not common among nomadic Masai, and, where they occur, /350/ they remain smaller and show a tendency to heal rapidly. Other illnesses arise from the unfamiliar diet. The rapid transition [262] from an almost pure meat diet to an almost pure vegetable diet makes demands on the stomach and intestines that a body weakened by fever is seldom equal to. Sickness and death from this cause are frequent and are increased further by the consumption of bad water. Thus, more than half the people in one settlement complained of painful diarrhea and bloody stools. All these acclimati- [192] [163] zation illnesses seem also to manifest their effect in decreased fertility of the women and increased child mortality. I was repeatedly struck by the small number of sucklings (two-year suckling period) and older children. Thus early in 1908 in Ngaruka, between Lake Manyara and Lake Natron, among a number of about 50 women, I found only twelve children, three of them babies. According to the statements of the parents, very many children had died of various ailments, especially fever, stomach and intestinal affections, several also had perished in Masai attacks. For the Masai who are becoming 178 619 sedentary, the ones still living among the "people" as nomads are 721 a scourge that scarcely falls short of the illnesses just mentioned in

/350 cont./

178 its effect. Hated as faithless and despised as agriculturalists, the
619 sedentary ones are constantly plagued by raids that not only cause
72 them great loss in human lives, but also take away any possibility
[829] for them to arrive at any improvement in their way of life by keeping
livestock for the attainment of the meat and milk diet so necessary
[177] for them. Moreover, the frequent intercourse with sedentary Negroes
[164] and caravan people leads to an increase in the cases of venereal
582 diseases. Premature marriages of girls, which can not happen among
178 the Masai still living as nomads, is not rare among the sedentary
184 ones and often enough leads to the death of the young woman who
165 is scarcely more than a child and whose bony structure, despite her
attained capability to conceive, is not yet developed. Finally, it
178 must still be mentioned that no doubt the longing for the formerly
182 free life in the broad steppes and the feeling of humiliation over
having become a so deeply despised cultivator of the soil oneself
[186] are factors that have a wasting effect. The latter circumstance also
[177] brings with it a decrease of national pride. The barrier that kept
[144] Negroes out of the community of the Masai has fallen. A disadvan-
tageous race mixture hurting the people is slowly taking place.
[648] Among the Wakuafi this process was more rapid in their period. At
[721] that time no European administration prevented their raiding exped-
itions in Negro regions, from which they brought home livestock
and women experienced in agriculture.

177 In frequent -- almost daily -- intercourse that soon springs up
178 and then continues to exist between the Masai who have become
sedentary and the settled Negroes, the Masai naturally also share
in the disadvantages that /351/ come to the Negroes through the
encounter of their lower culture with our higher one.

178 We have seen how many difficulties sedentation brings to the
177 Masai, and it is therefore not surprising that a part of those who
361 have already become sedentary give up their fixed residences again
after repeated failures. These then often join the Wandorobo, to
live by hunting, and call themselves this.

19: Talbot E-4,5 (1956-1962)1964 FL12 Masai FL12

*136 of Lake Victoria have long been occupied by dense human populations supported by the abundant fish of the lake
• [164] and the well watered agricultural land nearby. Movement of these people eastward into Masailand has been restricted by tsetse flies which carried both human and animal trypanosomes, and by the Masai within the past two centuries.

The one area where in historic times there was a significant break in the barriers of Western Masailand is in the northeast corner. The races of Thomson's gazelle, wildebeest (Fig. 5), and kongoni that were found in Western Masailand, were also found in the Kedong region of the Rift near Mt. Suswa, and northwards (Roosevelt and Heller, op.cit.). Wildebeests, as an example, were found in the Rift north and west of Nairobi at least until the time of the first world war. Meinertzhagen (1957) records them as being found on the south shore of Lake Naivasha in 1902. Roosevelt and Heller (1914) showed wildebeests occupying the center and west of the Rift in the vicinity of Mt. Suswa just south of Naivasha in 1909 and 1910, and Percival (1928) noted their distribution slightly earlier as extending to the East Rift Wall (near the present Kijabe). The animals involved were definitely the western form and not the

[TEXT CONTINUED ON PAGE 35]

*133 The map (Fig. 3)[1] shows the numbers of rivers that rise in the hills from the Kenya border to the northern edge of the Serengeti Plain. The Bologonja and several smaller springs are perennial, but most of these watercourses flow only during wet periods, or following occasional heavy rains during the dry periods (Fig. 18). At this time the catchment areas of the scattered hills are critically important.

*13 In the hills between the boundary of the Serengeti National Park and Loliondo, cutting, overburning, and overgrazing by the Masai have seriously reduced the watershed values of the area. Runoff is torrential after rains, and virtually no dry season surface water is available through the area. There are several bore holes (Fig. 19) which have the effect of concentrating livestock and causing very severe overgrazing in the vicinity.

*[312] *[233]

• [164] Across the hills in the park destruction of the vegetation has been very much less, largely because it is an area infested by tsetse fly, so the Masai have not grazed it much. The vegetation provides fair watershed and even the scattered dry season storms produce some surface water.

[1] [See p. 19.--Analyst]

*136 and the species of fly. It can vary from a few days to several weeks. When feeding, the fly may ingest trypanosomes from the blood of the host animal. Trypanosomes complete their life cycle inside the tsetse fly and after a varying period, usually about three weeks, the fly can infect another host animal while feeding [164] upon it. One trypanosome causes sleeping sickness in man and another the nagana disease in cattle and some other ungulates.

[164] Human sleeping sickness was formerly relatively common in the area from Ikoma and Banagi westwards. It has not been much problem since the late 1930's, presumably because the human cases have received treatment so that there are few infected host humans for the flies to bite. Nagana disease is common throughout the study area wherever there are tsetse flies. The cattle in the area are generally quite susceptible to nagana, while goats and sheep are highly resistant. The susceptability of various species of wild animals varies greatly from species to species, but most of the common wild ungulates are not affected, although some may serve as reservoirs for the trypanosomes.

Tsetse flies are quite specific in their host preferences. Langridge (1960, 1961) and Lamprey, et. al.